CLAIMS

1. A method of joining two silicon parts along respective joining areas, comprising the step:

providing a flowable mixture of a silicon powder and a silica bridging agent;

applying said flowable mixture to at least one of said joining areas;

assembling said two silicon parts with said respective joining areas in juxtaposition; and

annealing said assembled parts at an annealing temperature sufficient to convert said silica bridging agent to a silica network.

2. The method of Claim 1, wherein said annealing temperature is at least 400°C.

3. The method of Claim 2, wherein said annealing temperature is between 900°C and 1100°C.

4. The method of Claim 2, wherein said annealing temperature is at least 1200°C.

5. The method of Claim 4, wherein said annealing temperature is at least 1300°C.

6. The method of Claim 1, wherein said silicon powder comprises virgin polysilicon.

7. The method of Claim 1, wherein said silicon powder has a size of less than 100μm.

8. The method of Claim 7, wherein said size is between 1 and 50μm.

9. The method of Claim 1, wherein said silicon powder has a size distribution with a median size in a range of 10nm to 25nm.

10. The method of Claim 1, wherein said silicon powder has a size distribution with at least 99% of particles having a size of less than 100nm.

11. The method of Claim 1, wherein said silicon powder is formed by a CVD process creating particles of silicon.

12. The method of Claim 1, wherein said silica bridging agent comprises a silicone-containing material.

13. The method of Claim 1, wherein said silica bridging agent comprises a spin-on glass.

14. The method of Claim 13, wherein said flowable mixture consists of said spin-on glass and said silicon powder.

15 The method of Claim 14, wherein said silicon powder has a size distribution with at least 99% of particles having a size of less than 100nm.

16. The method of Claim 13, wherein said flowable mixture further comprises a retardant to slow setting of said silica bridging agent at room temperature.

17. The method of Claim 16, wherein said silica bridging agent comprises a spin-on glass and said retardant comprises an alcohol including less than 1% water.

18. The method of Claim 1, wherein said parts form part of a wafer support fixture.

19. A joined silicon assembly, comprising:

at least two silicon parts juxtaposed across respective pairs of joining areas separated by respective gaps; and

a composite bridging said gaps and comprising silicon crystallites having sizes of less than 100μm embedded in a matrix of silica.

20. The assembly of Claim 19, wherein said crystallites have a size distribution with at least 99% of particles of size of less than 100nm.

21. The assembly of Claim 19 configured as a support fixture for supporting a plurality of substrates in parallel orientations spaced along an axis of the fixture.

22. A substrate support fixture, comprising:

a plurality of silicon legs including teeth for supporting a plurality of substrate in parallel orientations;

two silicon bases joined to opposing ends of said legs across respective joints with respective gaps between a respective one of said bases and a respective one of said legs;

silicon crystallites having sizes of less than 100μm occupying at least 50% of said gaps; and

a silica network in each of said gaps joining said silicon crystallites and said legs and said bases.

23. The fixture of Claim 22, wherein said sizes are between 1 and 75μm.

24. The fixture of Claim 22, wherein said silicon crystallites have a size distribution with at least 99% of particles having a size of less than 100nm.

25. The fixture of Claim 22, wherein said legs comprise an arcuate back side opposite said tips of said teeth supporting said substrates.

26. A silicon support tower, comprising:

two silicon bases; and

at least three silicon legs joined to said bases, each comprising on a front side a plurality of teeth having support surfaces for supporting a plurality of substrates in parallel orientation and on a back side an arcuate surface about a median plane of said teeth matching arcuate surfaces formed in said bases.

27. The tower of Claim 26, further comprising a silicon and silica composite joining said bases and said legs.

28. An adhesive for joining two parts, comprising a mixture flowable a room-temperature application temperature composed of:

silicon particles having sizes of less than 100μm; and

a silica bridging agent in which said particles are dispersed and which chemically reacts to form a silica network when annealed at an elevated temperature above said application temperature.

29. The adhesive of Claim 28, wherein said silica bridging agent is a silicon-containing material.

30. The adhesive of Claim 28, wherein said silica bridging agent is a spin-on glass.

31. The adhesive of Claim 28, wherein 99% of said particles have a size of less than 100nm.

32. The adhesive of Claim 28, wherein said particles have size distribution with a median size in a range of 10 to 25nm.